Exhibit 13.b

1: Bioelectromagnetics. 1988;9(3):285-301.

Related Articles, Links

Mechanism of biological effects observed in honey bees (Apis mellifera, L.) hived under extra-high-voltage transmission lines: implications derived from bee exposure to simulated intense electric fields and shocks.

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This work explores mechanisms for disturbance of honey bee colonies under a 765 kV, 60-Hz transmission line [electric (E) field = 7 kV/m] observed in previous studies. Proposed mechanisms fell into two categories: direct bee perception of enhanced in-hive E fields and perception of shock from induced currents. The adverse biological effects could be reproduced in simulations where only the worker bees were exposed to shock or to E field in elongated hive entranceways (= tunnels). We now report the results of full-scale experiments using the tunnel exposure scheme, which assesses the contribution of shock and intense E field to colony disturbance. Exposure of worker bees (1,400 h) to 60-Hz E fields including 100 kV/m under moisture-free conditions within a nonconductive tunnel causes no deleterious affect on colony behavior. Exposure of bees in conductive (e.g., wet) tunnels produces bee disturbance, increased mortality, abnormal propolization, and possible impairment of colony growth. We propose that this substrate dependence of bee disturbance is the result of perception of shock from coupled body currents and enhanced current densities postulated to exist in the legs and thorax of bees on conductors. Similarly, disturbance occurs when bees are exposed to step-potential-induced currents. At 275-350 nA single bees are disturbed; at 600 nA bees begin abnormal propolization behavior; and stinging occurs at 900 nA. We conclude that biological effects seen in bee colonies under a transmission line are primarily the result of electric shock from induced hive currents. This evaluation is based on the limited effects of E-field exposure in tunnels, the observed disturbance thresholds caused by shocks in tunnels, and the ability of hives exposed under a transmission line to source currents 100-1,000 times the shock thresholds.

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